2.3a
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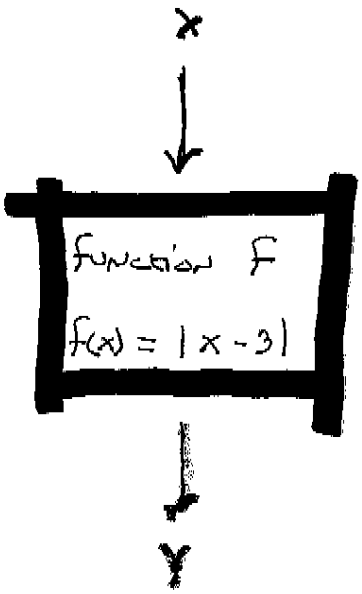
Functions, day 1

f is a function if each **possible** input x has one & only one corresponding output y.

Inputs x from the $\mathbb{R}$eal numbers



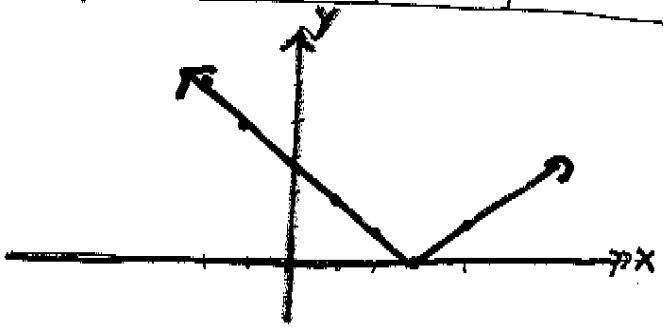
A black box for turning x's into y's

outputs y in the $\mathbb{R}$eal numbers.

x	-2	-1	0	1	2	3	4
y = f(x)	5	4	3	2	1	0	1

$x = -2 \rightarrow f(x) \rightarrow y = 5$

$x = -1 \rightarrow f(x) \rightarrow y = 4$



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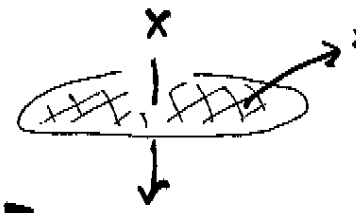
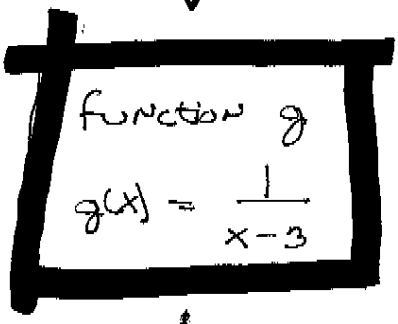
What does "**possible** input x" refer to?

Inputs from $\mathbb{R}$



Filter that only allows x values in the **domain** to pass thru.

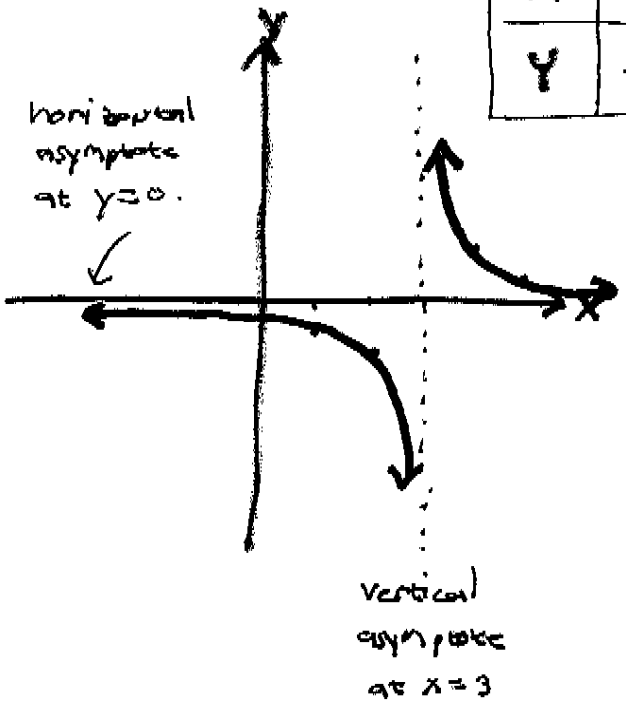


y

The y values that make it thru g make up the **Range** of g.

x	1	2	3	4	5
y	$-\frac{1}{2}$	-1	und.	1	$\frac{1}{2}$

$x=3$ is not in the domain.



Domain of g: $D_g = \{x \mid x \in \mathbb{R} \text{ and } x \neq 3\}$

"set of x's where x is a real number and $x \neq 3$."

Range of g: $R_g = \{y \mid y \in \mathbb{R} \text{ and } y \neq 0\}$.

"set of all y's where y is a real number and $y \neq 0$."

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Domain: Where x lives.

(the x values that make it thru the filter)

Range: Where y lives.

(all possible outputs of the function).

Function Notation

$f(x)$ "f of x"

$g(x)$ "g of x"

Let $f(x) = |x - 3|$ and $g(x) = \frac{1}{x-3}$

$f(-2)$ "f of -2" is "f evaluated when $x = -2$."

or "replace all occurances of x w/ -2 in $f(x)$."

$f(-2) = |-2 - 3| = 5$. ← y-value.

$g(4)$ "g of 4" is "g evaluated when $x = 4$."

$g(4) = \frac{1}{4-3} = \frac{1}{1} = 1$ ← y-value.

$g(x+h)$ "g of $x+h$" says, "replace all occurances of x in g w/ $x+h$."

$g(x+h) = \frac{1}{x+h-3}$ ← y-value.

$f(\text{☺})$ "f of ☺" says, "replace all occurances of x in f w/ ☺."

$f(\text{☺}) = |\text{☺} - 3|$ ← y-value.

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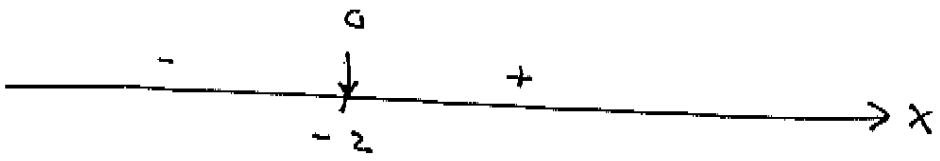
Find the domain of the following.

Ex. 1 $f(x) = \sqrt{x+2}$. The domain of f will only include x values that make $\sqrt{x+2}$ a real number.

$\Rightarrow x + 2 \geq 0$

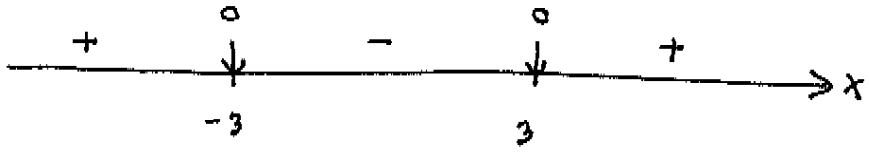


Domain of f: $D_f = \{x \mid x \geq -2\}$.

Ex 2: $g(x) = \sqrt{x^2-9}$. The domain of g will only include x's that make $\sqrt{x^2-9}$ real.

$\Rightarrow x^2 - 9 \geq 0$

$\Rightarrow (x+3)(x-3) \geq 0$



$D_g = \{x \mid x \leq -3 \text{ OR } x \geq 3\}$.

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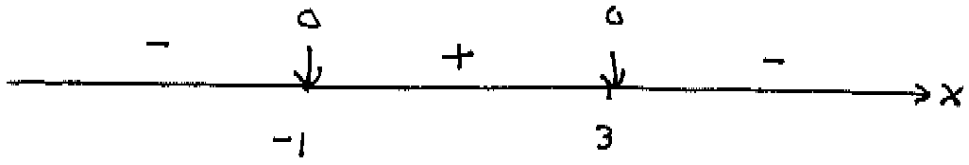
Ex 3: $h(x) = \sqrt{3 + 2x - x^2}$

$\Rightarrow \quad 3 + 2x - x^2 \geq 0$

$\Rightarrow \quad -(x^2 - 2x - 3) \geq 0$

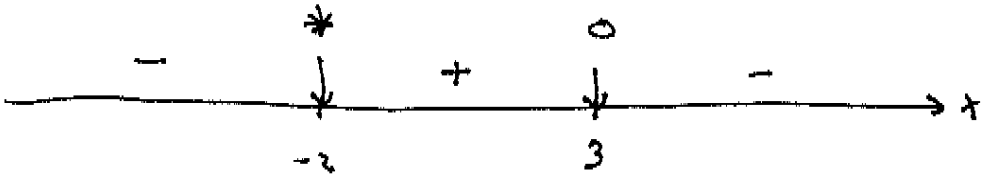
$\Rightarrow \quad -(x-3)(x+1) \geq 0$



$D_h = \{x \mid -1 \leq x \leq 3\}$.

Ex 4: $k(x) = \sqrt{\frac{3-x}{x+2}}$

$\Rightarrow \quad \frac{3-x}{x+2} \geq 0$



$D_k = \{x \mid -2 < x \leq 3\}$.

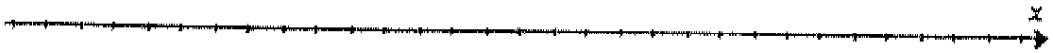
Handout – Functions
Dusty Wilson
Math 115

Example 1: Find the domain of $f(x) = \sqrt{x+2}$.

a.) The domain of f will only include:

b.) Algebraically, this means:

c.) Create a sign diagram of the expression directly related to (b.).



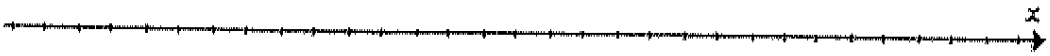
d.) Use the sign diagram to find the domain f?

Type of Notation	**Your Answer:**
i.) Graph on a number line	
ii.) Interval notation	
iii.) Inequality notation	
iv.) Set notation	

e.) Use and English sentence to express the domain in set notation.

Example 3: Find the domain of $h(x) = \sqrt{3 + 2x - x^2}$.

a.) Create a sign diagram of the expression directly related to h.



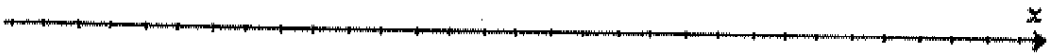
b.) Use the sign diagram to find the domain of h.

Type of Notation	**Your Answer:**
i.) Inequality notation	
ii.) Set notation	

c.) Use and English sentence to express the domain in set notation.

Example 4: Find the domain of $k(x) = \sqrt{\dfrac{3-x}{x+2}}$.

a.) Create a sign diagram of the expression directly related to k.



b.) Use the sign diagram to express the domain of k in set notation.